REMARKS

Favorable reconsideration of this application, in light of the following discussion and in view of the present amendment, is respectfully requested.

Claims 15 and 18 are amended. No new matter has been submitted. Claims 1-24 are pending in the application.

I. Rejections under 35 U.S.C. § 103

In the Office Action, at page 2, numbered paragraph 2, claims 1-4, 6-9, 11, 13-16, 18-21 and 23-24 were rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,880,901 to Smith et al. This rejection is respectfully traversed because Smith does not suggest at least:

> calculating deviations between a reference head and each of the heads;
>
> generating a mapping table, elements of which are deviations between the reference head and each of the heads, and storing the mapping table in a memory; and
>
> applying a deviation of the switched head, which is recorded in the mapping table, to the virtual track or the sector address of the track or the sector on which the switched head is positioned, to obtain the physical track or the sector address of the track on which the switched head is positioned,

as recited in independent claims 1 and 6.

Further, Smith does not suggest at least:

> setting the deviation of the reference head as a zero value;
>
> obtaining track address deviations of the heads with respect to the reference head and recording the deviations in the mapping table; and
>
> applying the track address deviation of the switched head stored in the memory to a virtual track address of a track on which the switched head is positioned and obtaining the physical track address of the track on which the switched head is positioned,

as recited in amended independent claim 11.

In addition, Smith does not suggest:

> calculating physical track addresses by referring to a mapping table stored in a memory, the mapping table storing a deviation between a reference head and other heads in the hard disk drive and the physical track addresses being calculated by applying a

> deviation of a switched head to a virtual track address of a track on which the switched head is positioned,

as recited in amended independent claim 15.

Also, Smith does not suggest that:

> the controller accesses a disk on the hard disk drive using physical track addresses read from disks on the hard disk drive and a mapping table stored in the memory, the mapping table storing a deviation between a reference head and other heads in the hard disk drive and the physical track addresses being calculated by applying a deviation of a switched head to a virtual track address of a track on which the switched head is positioned,

as recited in independent claim 18.

Further, Smith does not suggest:

> calculating deviations between a reference head and each of the heads;
>
> generating a mapping table, elements of which are deviations between the reference head and each of the heads, and storing the mapping table in a memory;
>
> applying a deviation of the switched head, which is recorded in the mapping table, to the virtual track or the sector address of the track or the sector on which the switched head is positioned, to obtain the physical track or the sector address of the track on which the switched head is positioned; and
>
> subtracting a physical address deviation of the reference head from each of the physical address deviations of the heads in order to make the physical address deviation of the reference head substantially zero;
>
> wherein the reference head is the head having a physical address whose absolute value is the least among read physical addresses of tracks or sectors on which the heads of a head assembly are positioned,

as recited in independent claims 23-24.

As a non-limiting example, an embodiment of the present invention as set forth in claim 1, for example, is directed to a method of switching heads in a hard disk drive. The method includes calculating deviations between a reference head and each of the heads in the disk drive. The method further includes generating and storing a mapping table that includes deviations between the reference head and each of the heads. When a head is switched, a deviation of the switched head is applied to the virtual track address of the track on which the switched head is positioned to obtain the physical track address of the track on which the

switched head is positioned in order to access the track based on the obtained physical track address.

The Office Action indicates that Smith sets forth a majority of the claimed features of independent claim 1. Applicants respectfully disagree.

Here, Smith discusses a method and apparatus for positioning a MR head in which servo information is provided to induce a thermal response in the MR head and a controller controls the relative movement between the MR head and the storage medium using the thermal response induced in the MR head. Smith further discusses that axial and relative head offset and track runouts for each MR head 80 may be stored in RAM and used for track following and track seeking. The position of each MR head 80 relative to other MR heads 80 can be determined using the axial head offset which is determined by averaging the absolute average measurements of disk eccentricity of a complete revolution.

Smith further discusses that the physical track zero of the MR head 80 with the largest axial offset is mapped to cylinder zero and MR heads 80 with less axial offset are mapped to higher physical track numbers based on the largest axial offset. For example, if an MR head number has the largest axial offset of 5.5 tracks, it is mapped to its physical track zero and the remaining MR heads 80 are mapped to physical tracks which are 5.5 tracks spaced from their positions in a calibration zone.

However, Smith does not discuss or suggest the claimed "calculating deviations between a reference head and each of the heads" and then "generating a mapping table, elements of which are deviations between the reference head and each of the heads," as recited in independent claim 1, for example.

Smith only discusses that the physical track zero of one of the heads having the largest axial offset is mapped to cylinder zero and then the other heads are mapped to higher physical track numbers based on their axial offset. Thus, while Smith discusses that the other heads are mapped to physical tracks which are spaced by the largest axial offset amount from their positions in the calibration zone, Smith does not discuss or suggest that a deviation is found between a reference head and each of the other heads.

Here, Smith merely makes mention of the fact that the position of each MR head relative to the other MR heads can be determined, but does not explicitly discuss or suggest that a deviation is found between the designated reference head and each of the other heads and that a mapping table is then generated, including elements which are deviations between the reference head and each of the other heads.

Smith further states that the physical track zero of the MR head with the largest axial offset is mapped to cylinder zero, and that the other heads are mapped to higher physical track numbers based on the largest axial offset.

Regardless, Smith is silent as to calculating a deviation between the designated reference head and the other heads and does not suggest that a mapping table is created that includes these deviations.

Further, Smith does not discuss or suggest "applying a deviation of the switched head, which is recorded in the mapping table, to the virtual track or the sector address of the track or the sector on which the switched head is positioned, to obtain the physical track or the sector address of the track on which the switched head is positioned," as recited in independent claim 1, for example.

The Office Action alleges that Smith teaches "applying a deviation of the switched head, which is recorded in the mapping table, to the virtual track or the sector address of the track or the sector on which the switched head is positioned, to obtain the physical address or the sector address of the track on which the switched head is positioned."

However, contrary to this statement, the Office Action alternately also concludes that "it is obvious that if the heads have been placed with a respective deviation or offset according to its physical address, then when accessing a specific physical address, the respective head will be applied its respective offset in order to access that physical address", i.e., concluding that applying a deviation of the switched head is not shown in Smith. Thus, it is not inherent nor is it suggestive from Smith that a deviation, which is recorded in the mapping table, is applied to a virtual track or sector address of the track or sector on which the switched head is positioned to obtain the physical track or sector address of the track on which the switched head is positioned.

Therefore, as Smith does not discuss or suggest "calculating deviations between a reference head and each of the heads; generating a mapping table, elements of which are deviations between the reference head and each of the heads, and storing the mapping table in a memory; and applying a deviation of the switched head, which is recorded in the mapping table, to the virtual track or the sector address of the track or the sector on which the switched head is positioned, to obtain the physical track or the sector address of the track on which the switched head is positioned," as recited in independent claims 1 and 6, claims 1 and 6 patentably distinguish over the reference relied upon.

Independent claims 11, 15, 18 and 23-24 set forth at least similar allowable features, with differing scope and breadth, and are believed to be allowable for at least similar rationale.

With respect to claims 23-24 in particular, Smith does not discuss and does not suggest "accessing the track or the sector to be accessed based on the obtained physical track or sector address; and subtracting a physical address deviation of the reference head from each of the physical address deviations of the heads in order to make the physical address deviation of the reference head substantially zero; wherein the reference head is the head having a physical address whose absolute value is the least among read physical addresses of tracks or sectors on which the heads of a head assembly are positioned," as recited in claim 23, and does not suggest "accessing the track or sector to be accessed based on the obtained physical track or sector address; and subtracting a physical address deviation of the reference head from each of the physical address deviations of the heads in order to make the physical address deviation of the reference head substantially zero; wherein the reference head is the head having a physical address whose absolute value is the least among read physical addresses of tracks or sectors on which the heads of a head assembly are positioned," as recited in claim 24.

In particular, Smith states that the reference head with the largest axial offset is mapped to cylinder zero as the reference head. The reference head of the present invention is the head having a physical address whose absolute value is the least among read physical addresses.

Thus, contrary to the proposition in the Office Action, Applicants respectfully submit that the corresponding claimed features are not disclosed by Smith. Therefore, claims 23-24 are allowable over the reference relied upon.

Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

Claims 2-4, 7-9, 13-14, 16 and 19-21 depend either directly or indirectly on independent claims 1, 6, 11, 15 and 18, and include all the features of their respective independent claims, plus additional features that are not discussed or suggested by the reference relied upon.

For example, claim 5 recites "defining an available data zone, wherein the available data zone ranges from the first track from the outer boundary of a disk accessed by the reference head to the last track at the inner boundary of a disk accessed by a head having the greatest physical address deviation."

Therefore, claims 2-4, 7-9, 13-14, 16 and 19-21 patentably distinguish over the reference relied upon for at least the reasons noted above. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

In the Office Action, at page 6, numbered paragraph 3, claims 5, 10 and 22 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of U.S. Patent No. 6,975,468 to Melrose et al. This rejection is respectfully traversed.

Here, similar to above, Melrose does not discuss that deviations between a reference head and other heads in a hard disk drive are calculated and the deviations are used to obtain the physical track address of the track on which a switched head is positioned.

Melrose further does not discuss or suggest that both the physical address of a track and a mapping table storing the deviations calculated are used to access a track on a disk. Melrose only discusses that data is allowed to be written only to a target track when the transducer is within a positioned window about the target track that is defined by the off-track threshold value.

Melrose does not discuss a deviation, nor does Melrose discuss applying the deviation *calculated between a reference head and the other heads* in the disk drive to a virtual track address to obtain the physical track address of the track where the head is positioned.

Therefore, as the combination of Smith and Melrose does not teach all the features of independent claims 1, 6 and 18, as is required in establishing a *prima facie* case of obviousness, claims 1, 6 and 18 patentably distinguish over the references relied upon. Claims 5, 10 and 22 depend either directly or indirectly from claims 1, 6 and 18 and include all the features of their respective independent claims, plus additional features that are not discussed or suggested by the references relied upon.

Specifically, Melrose does not discuss and does not suggest that "available data zone ranges from the first track from the outer boundary of a disk accessed by the reference head to the last track at the inner boundary of a disk accessed by a head having the greatest physical address deviation," as recited in claims 5 and 10. Therefore, claims 5, 10 and 22 patentably distinguish over the references relied upon for at least the reasons noted above. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

In the Office Action, at page 7, numbered paragraph 4, claims 12 and 17 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Smith in view of U.S. Patent No. 5,969,895 to Ueda et al. This rejection is respectfully traversed.

As discussed above, Smith does not suggest all the features of independent claims 11 and 15, from which claims 12 and 17 depend. The Examiner indicates that Ueda makes up for the deficiencies in Smith. Applicants respectfully disagree.

Ueda discusses a method for switching heads in a disk drive. Ueda includes an offset quantity table that stores offset quantity for each of the heads, the offset quantity being a value representative of the distance of a head with respect to a reference head, and the values corresponding to the amount of off-track offset between heads are used to determine the head

switching sequence. Particularly, in Ueda, the next head to switch to is the head having the smallest offset quantity.

However, Ueda does not make up for the deficiencies in Smith, in that Ueda does not suggest "setting the deviation of the reference head as a zero value; obtaining track address deviations of the heads with respect to the reference head and recording the deviations in the mapping table; and applying the track address deviation of the switched head stored in the memory to a virtual track address of a track on which the switched head is positioned and obtaining the physical track address of the track on which the switched head is positioned," and does not suggest "calculating physical track addresses by referring to a mapping table stored in a memory, the mapping table storing a deviation between a reference head and other heads in the hard disk drive and the physical track addresses being calculated by applying a deviation of a switched head to a virtual track address of a track on which the switched head is positioned." Therefore, as Ueda does not make up for the deficiencies in Smith and the combination of Smith and Ueda does not teach all the features of independent claims 11 and 15, claims 11 and 15 patentably distinguish over the references relied upon.

Claims 12 and 17 depend either directly or indirectly from independent claims 11 and 15 and include all the features of their respective independent claims, plus additional features that are not discussed or suggested by the references relied upon. For example, claim 12 recites that "the arbitrary locations are over middle areas of corresponding disk surfaces." Therefore, claims 12 and 17 patentably distinguish over the references relied upon for at least the reasons noted above. Accordingly, withdrawal of the § 103(a) rejection is respectfully requested.

Conclusion

In accordance with the foregoing, claims 15 and 18 have been amended. Claims 1-24 are pending and under consideration.

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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